testo 549 - testo 550 . Digital manifold

Instruction manual

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2 Safety and the environment

2.1. About this document

Use

> Please read this documentation carefully and familiarize yourself with the product before putting it to use. Pay particular attention to the safety instructions and warning advice in order to prevent injuries and damage to the product.

Symbols and writing standards

Representation	Explanation
	Warning advice, risk level according to the signal word: **Warning!** Serious physical injury may occur. **Caution!** Slight physical injury or damage to the equipment may occur. > Implement the specified precautionary measures.
Menu	Elements of the instrument, the instrument display or the program interface.
[OK]	Control keys of the instrument or buttons of the program interface.

2.2. Ensure safety

> Do not operate the instrument if there are signs of damage at the housing, mains unit or hoses.

> Do not store the product together with solvents. Do not use any desiccants.

> Carry out only the maintenance and repair work on this instrument that is described in the documentation.

> Dangers may also arise from the refrigeration systems being measured or the measuring environment: Note the safety regulations valid in your area when performing the measurements.

> If the manifold falls or another comparable mechanical load occurs, the pipe sections of the refrigerant hoses may break. The valve stem shutoff may also be damaged, whereby further damage to the interior of the manifold may occur that cannot be identified from the outside. The refrigerant hoses must therefore be replaced with new, undamaged refrigerant hoses every time the manifold falls or following any other comparable mechanical load. Send the manifold to Testo Customer Service for a technical check for your own safety.
> To prevent damage from ESD (electro-static discharge) or transient voltage spikes make sure that your refrigeration system is properly grounded, as otherwise the manifold might get damaged.

2.3. Protecting the environment

> Dispose of spent batteries in accordance with the valid legal specifications.
> At the end of its useful life, send the product to the separate collection for electric and electronic devices (observe local regulations) or return the product to Testo for disposal.
> Refrigerant gases can harm the environment. Please note the applicable environmental regulations.

3 Product description

3.1. Use

Testo 549 and testo 550 are digital manifolds for maintenance and service work on refrigeration systems and heat pumps. They are intended for use by qualified personnel only.

The functions of the testo 549 and testo 550 are designed to replace analog manifolds, thermometers and pressure/temperature charts. Pressures and temperatures can be applied, adapted, tested and monitored.

Testo 549 and testo 550 are compatible with most non-corrosive refrigerants, water and glycol. Testo 549 and testo 550 are not compatible with refrigerants containing ammonia.

The instruments must not be used in explosive environments!

3.2. Overview

Display and control elements

1 Mini-DIN probe socket for NTC temperature probe, with socket cover

2 Foldable hanging hook (on rear)

3 Display. Instrument status icons:

Icon	Significance
	Battery status
	Bluetooth®
	Measuring mode

4 Battery compartment. NOTE: Rechargeable batteries cannot be charged inside the battery compartment.

5 Control keys:

Key	Function
[Set]	Set units
[R, ►, ■]	Select refrigerant/ Start/stop / Leakage test
[Mode]	Change measuring mode to Leak mode
[Min/Max/Mean]	Display min./max./mean values
[▲]	Up key: Scroll through menu
[P=0]	Pressure zeroing
Esc	Switches to the measurement / home view
[▼]	Down key: Scroll through menu
[⏻/☼]	Switching the instrument on/off Switch the display illumination on/off.

6 Sight glass for refrigerant flow

7 2 x valve stem shutoff

8 3 x hose holders for refrigerant hoses

9 3 x connections 1/4" SAE, brass
Left/right: Low pressure/high pressure, for refrigerant hoses with quick connect fitting

Center: for charge / discharge of refrigerant

10 Mini-USB connection for firmware update, inside the battery compartment.

4 First steps

Inserting batteries / rechargeable batteries

1. Fold out the hanging hook and open the battery compartment by squeezing the clip lock.
2. Insert batteries (included in delivery) or rechargeable batteries (4x 1.5 V, type AA/Mignon/LR6) in the battery compartment. Observe the polarity!
3. Close the battery compartment.

- After inserting the batteries, the instrument switches on automatically and goes into the settings menu.

When not in use for long period: Remove batteries/rechargeable batteries.

Units / Parameter selection

1. Press **[Set]** to confirm or change unit parameter settings
2. Press **[▲]** or **[▼]** to change the units / parameters.

– The settings will be accepted once the last selection has been made.

Key functions	Description
[▲] or **[▼]**	Change parameters and select units
[Set]	Confirm units / parameters

Selectable parameters	Description
°F, °C	Temperature unit
Psi, bar, kPa, MPa	Unit of pressure
Psig or Pabs, Prel	Switch between absolute and relative pressure display
Pamb	Set current absolute pressure in inches of HG or bar
/ /	Select measuring mode: heat pump / cooling / or Auto
AUTO OFF	Activate or deactivate Automatic power-off. Instrument switches off after 30 minutes if no temperature probe is connected and there is no pressure apart from ambient pressure
T_{fac}	Activate or deactivate surface temperature compensation factor, icon is shown on the display if the function is deactivated

– Settings will be applied following the final selection.

Operating valve stem shutoffs

The digital manifold acts like a conventional two-way manifold with regard to the refrigerant path: The passages are opened by opening the valves. The adjacent pressure is measured with valves closed as well as with them open.

> Open valve: Turn valve positioner counterclockwise.

> Close valve: Turn valve positioner clockwise.

WARNING

Over tightening the valve stem shutoffs may cause:

- Damage to the PTFE seal.
- Mechanical deformation of the valve piston leading to the PTFE seal falling out.
- Damage to the thread of the threaded spindle and the valve screw.
- valve knobs to brake.

Lightly tighten the valve knob. Do not use tools to tighten the valve stem shutoffs.

5 Using the manifold

5.1. Preparing for measurement

5.1.1. Switching the instrument On

> Press [⏻/☼].

Zero the pressure sensors before every measurement.

✓ All connections must be at ambient pressure.

> Press **[P=0]** key for 3 seconds to execute zeroing.

Connecting the refrigerant hoses

Before each measurement check whether the refrigerant hoses are in flawless condition.

✓ Make sure the valve stem shutoffs are closed.

1. Connect the refrigerant hoses to the low-pressure side (blue) and high-pressure side (red).
2. Connect the refrigerant hoses to the AC/R system.

WARNING

Dropping this instrument or any other comparable mechanical shock can damage the refrigerant pipes and hoses. The valve actuators may also suffer damage, which in turn could result in further damage inside the instrument and may not be detectable from outside.

> For your own safety you should return the manifold to the Testo Service Department for technical inspection.

> You should therefore always replace the refrigerant hoses with new ones after an accidental drop has occurred or after any visible wear and tear.

Choosing the refrigerant

1. Press **[R, ►, ■]**.

- It activates the refrigerant menu and the currently selected refrigerant flashes.

2. Setting the refrigerant:

Key functions	Description
[▲] or **[▼]**	Selecting another refrigerant
[R, ►, ■]	Confirm the selection and exit the refrigerant menu

Available refrigerants

Representation	Description
R...	Refrigerant number of refrigerant acc. to ISO 817
---	no refrigerant selected.

Example: Selecting refrigerant R401B

1. Press **[R, ►, ■]** to activate refrigerant menu.
2. Press **[▲]** or **[▼]** several times, until **R401B** flashes.
3. Press **[R, ►, ■]** to confirm the selection.

Exiting the refrigerant selection

> Press **[R, ►, ■]** or automatically after 30 s, if no other key has been pressed.

5.1.2. Connecting temperature probe(s)

Note: The testo 549 does not include temperature probes in the initial scope of delivery.

Surface temperature probe

At least one NTC temperature probe must be connected to measure the pipe temperature, for automatic calculation of superheating and subcooling.

Deactivating the surface compensation factor for insertion and air temperature probes

A surface compensation factor has been set in the measuring instrument to improve the measuring accuracy of surface temperature readings.

If the manifold is used in combination with insertion or air temperature probe (optional), this factor must be deactivated:

1. Press **[Set]** repeatedly until T_{fac} is displayed.
2. Press **[▲]** or **[▼]** to set T_{fac} to Off.
3. Press **[Set]** to continue through the settings menu until the measurement/home view is displayed.

- T_{fac} is shown on the display if T_{fac} is disabled.

5.1.3. Switching Bluetooth® on and off (only testo 550)

In order to to establish a connection via Bluetooth, on an Android or iOS device, the Testo App Refrigeration must be already installed.

You can download the App for iOS in the Apple App Store or for Android in Google Play.

The App is compatible with devices using iOS 7 or higher / Android 4.3 or 4.4.

1. To turn on the Bluetooth press **[▲]** and **[▼]** simultaneously and hold down for 3 seconds.

- Once the Bluetooth icon is shown on the display, Bluetooth is switched on.

Display	Description
flashes	There is no Bluetooth connection, or a potential connection is being searched for.
is permanently displayed	There is a Bluetooth connection.

Display	Description
is not displayed	Bluetooth is disabled.

2. To turn off the Bluetooth press **[▲]** and **[▼]** simultaneously and hold down for 3 seconds.

- Once the Bluetooth icon is no longer shown on the display, Bluetooth is switched off.

5.1.4. Measuring mode

Display	Mode	Function
	Refrigeration system	Normal functionality of the digital manifold
	Heat pump	Normal functionality of the digital manifold
	Automatic mode	If the automatic mode is activated, the testo 549 und testo 550 digital manifolds automatically changes the display of the high and low pressure. This automatic change occurs when the pressure on the low-pressure side is 1 bar (15 psi) higher than the pressure on the high-pressure side. During the change, **Load** (2 s) is shown in the display. This mode is especially suited to air conditioning systems which cool and heat (heat pumps).

5.2. Performing the measurement

WARNING

Risk of injury caused by refrigerant that is at high pressure, hot, cold, or poisonous!

> Wear safety goggles and protective gloves.

> Before pressurizing the measuring instrument: Always fasten the measuring instrument at the hanging hook in order to prevent it from falling (risk of breakage)

> Check if the refrigerant hoses are intact and connected correctly before each measurement. Do not use a tool to connect the hoses. Only tighten the hoses by hand (max. torque 5.0 Nm/3.7 ft*lb).

> Do not exceed the permissible measuring range (0 to 870 psi / 0 to 60 bar). Pay particular attention with systems with refrigerant R744, as these are often operated with higher pressures.

Measuring

1. Connect and apply pressure to the manifold.
2. See readings.

Note: With refrigerants that have a temperature ***glide***, “Zeotropes” the evaporation temperature Ev/to and condensation temperature Co/tc are displayed after evaporation and condensation are complete.

Zeotropes (refrigerants blends mix together) can separate from each other, unlike azeotropes which mix together to become one.

Zeoptropes often blend refrigerants with different boiling points (saturation temps), where one will change from liquid to vapor before the other as they go through the evaporator.

The ***glide*** is the difference between the *lowest boiling point* and the *highest boiling point*. If they are 3 degrees apart, for example, the blend has a 3 degree glide.

- The display illumination will flash if:

• The critical pressure of the refrigerant is within 15 psi (1 bar) of the highest pressure (and temperature) where the refrigerant can still condense
• The maximum. permissible pressure of 870 psi (60 bar) is exceeded.

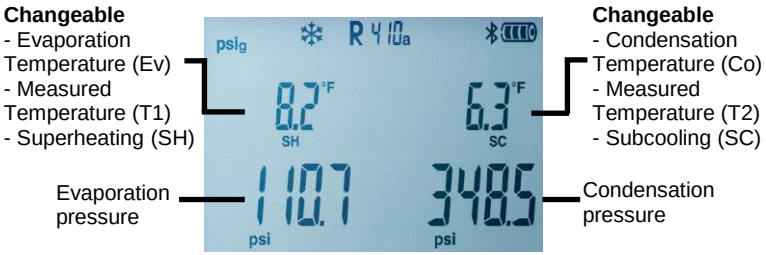
Key functions for 550 or 549 when used with optional probes

> Press **[▲]** or **[▼]** to change the reading in the display.

(The temperature probes must be connected.)

Possible display combinations:

Refrigerant evaporation temperature Ev/to (°F/°C)	**Refrigerant condensation temperature** Co/tc (°F/°C)
Evaporation pressure (psi/bar)	**Condensation pressure (psi/bar)**
Measured temperature T1/t_{oh} (°F/°C)	**Measured temperature T2/t_{cu}** (°F/°C)
Evaporation pressure (psi/bar)	**Condensation pressure (psi/bar)**
Superheating SH/Δt_{oh} (°F/°C)	**Subcooling SC/Δt_{cu}** (°F/°C)
Evaporation pressure (psi/bar)	**Condensation pressure (psi/bar)**



With both NTC temperature probes connected, Δt is also shown.

> Press **[Mean/Min/Max]** to display min./max. readings and mean values.

Leak test / pressure drop test

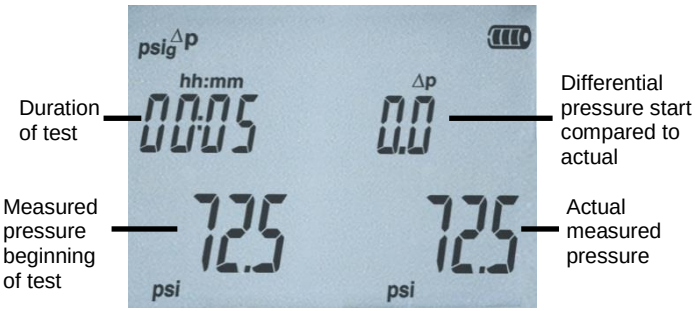
Systems can be tested for tightness with the temperature-compensated leak test. The system pressure and the ambient temperature are measured over a defined period of time, typically with an inert gas such as Nitrogen. A temperature probe can be connected that measures the ambient temperature. : Optional air temperature probe, part. no. 0613 1712) is recommended.

Measurement data of the temperature-compensated differential pressure and temperature, from start to the end of the test, is displayed. It is possible to perform a leak test without connecting a temperature probe.

1. Press **[Mode] ΔP** is displayed.
2. Start the leakage test: Press **[R, ►, ■].ΔP** is now flashing and hh:mm timer is on.
3. End the leakage test: Press **[R, ►, ■]**. **ΔP** stops flashing and hh:mm timer stops.

- Result is displayed. Note: Leak test time duration and **ΔP** value

4. Confirm message: Press **[Mode]** to exit leak mode.



6 Technical data

6.1.1. Bluetooth module (only testo 550)

The Bluetooth® option may only be operated in countries in which it is approved.

Feature	Values
Bluetooth type	LSD Science & Technology Co., Ltd L Series BLE module (08 May 2013) based on TI CC254X chip
Qualified Design ID	B016552
Bluetooth radio class	Class 3
Bluetooth listing company	10274

European Union

Germany (DE), Belgium (BE), Netherlands (NL), Spain (ES), Sweden (SE), Italy (IT), Denmark (DK), United Kingdom (GB), France (FR), Austria (AT), Poland (PL), Hungary (HU), Romania (RO), Czech Republic (CZ), Finland (FI),

EFTA countries

Switzerland (CH), Norway (NOR)

Other countries

Turkey (TR), India (IN), Australia (AUS), New Zealand (NZL), USA (US), Argentina (AR), Hong Kong (HK)

Information from the FCC (Federal Communications Commission)

This device complies with part 15 of the FCC Rules. Its commissioning is subject to the following two conditions: (1) This device may not cause harmful interference and (2) this device must be able to accept interference, even if this could have undesired effects on the operation.

Changes

The FCC demands that the user be informed that any changes or modifications to the instrument that are not explicitly approved by testo AG may void the user's right to use this instrument.

6.1.2. General technical data

Characteristic	Values
Parameters	Pressure: kPa / MPa / bar / psi Temperature: °C / °F / K
Sensors	2 Pressure: sensors, 2 Temperature (NTC Thermistors)
Meas. cycle	0.5 s
Interfaces	Pressure connections: 3 x 1/4" SAE 2 Temperature NTC measurement channels
Measuring ranges	HP/LP pressure measuring range: -100 to 6000 kPa / -0.1 to 6 MPa / -1 to 60 bar (rel) / -14.7 to 870 psi Temperature measuring range: -50 to +150 °C / -58 to 302°F Vacuum measuring range (rel): -1 to 0 bar / -14.7 to 0 psi
Overload	65 bar, 6500 kPa, 6.5 MPa, 940 psi
Resolution	Pressure resolution: 0.01 bar / 0.1 psi / 1 kPa / 0.001 MPa Temperature resolution: 0.1 °C/0.1 °F
Accuracy (nominal temperature 22 °C/71.6 °F)	Pressure: ± 0.5 % FS Temperature 58 to 302°F (0.9°F ± 1 digit) 0 to 150°C (±0.5 °C ±1 digit)
No. of refrigerants	60
Selectable refrigerants	No refrigerant, R11, R12, R22, R123, R1234ze, R125, R13B1, R134a, R14, R142B, R152a, R161, R23, R227, R290, R32, R401A, R401B, R401C, R402A, R402B, R404A, R406A, R407A, R407B, R407C, R407D, R407F, R408A, R409A, R410A, R411A, R412A, R413A, R414B, R416A, R417A, R420A, R421A, R421B, R422A, R422B, R422C, R422D, R424A, R426A, R427A, R434A, R437A, R438A, R502, R503, R507, R508A, R508B, R600, R600a, R718 (H_2O), R744 (CO_2) (only in measuring range up to 870 psi (60 bar), R1234yf

Measurable media	All refrigerants that are stored in the testo 549 and testo 550 Ammonia (R717) and other refrigerants which contain ammonia will damage the manifold
Ambient conditions	Operating temperature: -4 to 122 °F (-20 to 50 °C) Storage temperature: -4 to 140 °F (-20 to 60 °C)
Bluetooth	Range >20 m / 65 ft (unobstructed field)
Housing	Material: ABS/PA/TPU Dimensions: 7.87 x 4.29 x 2.48 in. (265 x 135 x 75 mm) Weight: approx. 2.83 lbs. 1060 g (without batteries)
IP class	42
Power supply	4 x 1.5 V, type AA/mignon/LR6 rechargeable or standard batteries Battery life: approx. 250h (display light off, Bluetooth off)
Display	Type: Illuminated LCD Response time: 0.5 s
Directives, standards and tests	EC Directive: 2014/30/EC
Warranty	Duration: 2 years Warranty conditions: see website www.testo.com/warranty

7 Maintaining the product

Cleaning the instrument

Do not use harsh cleaning agents or solvents! Mild soap and water may be used.

> Clean instrument using a damp cloth.

Keeping connections clean

> Keep screw connections clean and free of grease and other deposits, clean with a moist cloth as required.

Removing oil residues

> Carefully blow out oil residues in valve block using compressed air.

To ensure measuring accuracy

> Check instrument regularly for leaks (recommended: annually). Do not exceed the pressure range!

> Calibrate instrument regularly (recommended: annually).

Changing batteries/rechargeable batteries

✓ Instrument is switched off.

1. Fold out the hook, loosen the clip and remove the cover of the battery compartment.
2. Remove discharged batteries/rechargeable batteries and insert new batteries/rechargeable batteries (4x 1.5 V, type AA, Mignon, LR6) in the battery compartment. Observe the polarity!
3. Set on and close cover of the battery compartment (clip must engage).
4. Switch the instrument on.

Changing the valve or valve stem shutoff
DO NOT ATTEMPT to change the valve stems. Changing the valve stem shutoff or valves themselves will void the warranty. Send the measuring instrument to Testo Customer Service.

8 Tips and assistance

8.1. Questions and answers

Question	Possible causes/solution
flashes	Batteries are nearly discharged. > Replace batteries.
The instrument switches off automatically.	Batteries are discharged. > Replace batteries.
uuuu lights up instead of the parameter display	The maximum measurement range has been exceeded.
oooo lights up instead of the parameter display	Under range value has been exceeded.

8.2. Measurement parameters

bar, °C	psi, °F	Description
Δtoh	SH	Superheating, evaporation pressure
Δtcu	SC	Subcooling, condensation pressure
to	Ev	Refrigerant evaporation temperature
tc	Co	Refrigerant condensation temperature
toh	T1	Measured temperature, evaporation
tcu	T2	Measured temperature, condensation

8.3. Error reports

Question	Possible causes/solution
---- is lit up instead of measurement parameter display	Sensor or cable defective > Please contact your dealer or Testo Customer Service
Display **EEP FAIL**	Electronics (Hardware Fault) > Please contact Testo Customer Service

8.4. Accessories and spare parts

Description	Article no.
Temperature clamp probe - 4.9 ft. cable length (1.5m)	0613 5505
Temperature clamp probe - 14 ft. cable length (5m)	0613 5506
Pipe wrap probe with Velcro tape	0613 4611
Watertight NTC surface probe	0613 1912
Precise, robust NTC air probe	0613 1712
Transport case for measuring instrument, probe and hoses	0516 0012

For a complete list of all accessories and spare parts, please refer to the product catalogues and brochures or look up our website at: www.testo.com

If you have any questions, please contact your dealer or Testo Customer Service. The contact details can be found on the back of this document or on the Internet at **www.testo.com/service-contact.**

Click onto your country's flag for local support.

9 EC declaration of conformity

CE

Wir messen es. testo

EG-Konformitätserklärung

Für die nachfolgend bezeichneten Produkte:

EC declaration of conformity

We confirm that the following products:

testo 549

Best. Nr.: / Order No.: 0560 0550

wird bestätigt, daß sie den wesentlichen Schutzanforderungen entsprechen, die in der Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die **elektromagnetische Verträglichkeit** (2014/30/EU) festgelegt sind entspricht.

corresponds with the main protection requirements which are fixed in the EEC "Council Directive 2014/30 EU on the approximation of the laws of the member states relating to electromagnetic compatibility". The declaration applies to all samples of the above mentioned product.

Zur Beurteilung der Erzeugnisse hinsichtlich elektromagnetischer Verträglichkeit wurden folgende Normen herangezogen:

For assessment of the product following standards have been called upon:

Störaussendung/ *Pertubing radiation*:	**DIN EN 61326-1:2013 class B**
Störfestigkeit: / *Pertubing resistance*:	**DIN EN 61326-1:2013 table 1**
Sicherheits-Richtlinie:	**EN 60950-1:2006 +A11:2009 +A1:2010 +A12:2011**

Diese Erklärung wird für:

This declaration is given in responsibility for:

Testo AG
Postfach / *P.O. Box* 1140
79849 Lenzkirch / Germany
www.testo.com

abgegeben durch / *by:*

Dr. Jörk Hebenstreit
(Name / *name*)

Managing Director
(Stellung im Betrieb des Herstellers)
(Position in the company of the manufacturer)

Lenzkirch, 18.02.2015
(Ort, Datum / *place, date*)

(Rechtsgültige Unterschrift)
(*Legally valid signature*)

Uwe Haury
(Name / *name*)

Head of Qualification & Test
(Stellung im Betrieb des Herstellers)
(Position in the company of the manufacturer)

i.V.
(Rechtsgültige Unterschrift)
(*Legally valid signature*)

ISO 9001 TESTO QUALITY certified

Der Hersteller betreibt ein zertifiziertes Qualitätssicherungssystem nach DIN ISO 9001

The manufacturer operates a certified quality assurance system according to DIN ISO 9001

CE

Wir messen es. testo

EG-Konformitätserklärung

EC declaration of conformity

Für die nachfolgend bezeichneten Produkte:

We confirm that the following products:

testo 550

Best. Nr.: / Order No.: 0560 1550

wird bestätigt, daß sie den wesentlichen Schutzanforderungen entsprechen, die in der Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die **elektromagnetische Verträglichkeit** (2014/30/EU) festgelegt sind und bei bestimmungsmäßiger Verwendung den grundlegenden Anforderungen gemäß Artikel 3 der R&TTE-Richtlinie 1999/5/EG entspricht.

corresponds with the main protection requirements which are fixed in the EEC "Council Directive 2014/30 EU on the approximation of the laws of the member states relating to electromagnetic compatibility" and comply with the essential requirements of Article 3 of the R&TTE 1999/5/EC Directive. The declaration applies to all samples of the above mentioned product.

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Störfestigkeit: / *Pertubing resistance*:	**DIN EN 61326-1:2013 table 1**
R&TTE Richtlinie:	**EN 300 328 V1.8.1: 2012** **EN 301 489-1 V1.9.2: 2011-09** **EN 301 489-17 V2.2.1: 2012-09**
Sicherheits-Richtlinie:	**EN 60950-1:2006 +A11:2009 +A1:2010 +A12:2011**

Diese Erklärung wird für:

This declaration is given in responsibility for:

Testo AG
Postfach / *P.O. Box* 1140
79849 Lenzkirch / Germany
www.testo.com

ISO 9001 TESTO QUALITY certified

Der Hersteller betreibt ein zertifiziertes Qualitätssicherungssystem nach DIN ISO 9001

The manufacturer operates a certified quality assurance system according to DIN ISO 9001

abgegeben durch / *by:*

Dr. Jörk Hebenstreit
(Name / *name*)

Managing Director
(Stellung im Betrieb des Herstellers)
(Position in the company of the manufacturer)

Lenzkirch, 18.02.2015
(Ort, Datum / *place, date*)

(Rechtsgültige Unterschrift)
(*Legally valid signature*)

Uwe Haury
(Name / *name*)

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